REMARKS

This amendment is responsive to the Office Action mailed August 20, 2003 in connection with the above-identified patent application. In that Action, the title of the invention was indicated by the Examiner as not being descriptive. A new title was required and is provided above. Also, the objection to the drawings under 37 C.F.R. § 1.83(a) was withdrawn. The numbering of the claims was noted by the Examiner as not being in accordance with 37 C.F.R. § 1.126. The Examiner renumbered claims 10-28 as claims 11-29. The previous rejection of claims 11-18 and 20-29 under 35 U.S.C. § 112, first paragraph was withdrawn. Claims 1, 11, 12, 15-18, 20-24, 26, 28, and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,975,607 to Hara, et al. and U.S. Patent No. 5,376,850 to Elsing, et al. Claims 13, 14, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hara, et al. and Elsing, et al. and further in view of foreign patent GB 2 293 695 to Norton, et al. Lastly, claim 19 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hara, et al. and Elsing, et al. and further in view of U.S. Patent No. 5,942,821 to Shin.

The Present Application:

For purposes of review, the present application is directed to an electromotive drive system for use with a pump of a power-assisted steering system in a motor vehicle. One advantage offered by the invention of the application is that an electromotive drive for the pump is provided wherein disturbing noises caused by vibrations are reduced and/or prevented. Prior art electromotive drive systems included

a rigid coupling between a stator and a shaft support system. This generated a "tuning fork" effect when the resonant frequency of the system falls in the range of the unavoidable high frequency torque vibrations. Such torque variations or vibrations are particularly unavoidable with electric motors and which have sufficient amplitude to lead to the disturbing noises, especially when the pump is operated with a full load.

In accordance with one aspect of the present invention, the rigid coupling between the stator and the shaft support is eliminated with respect to torque transmission. The transmission of the torque moment occurs essentially only via the coupling of the stator with the remaining housing and not through the shaft support. The shaft support serves only for positioning the stator in the plane which extends transversely in relation to the shaft support.

An improved suppression of the disturbing noises is obtained by providing a gap between the interior wall of the stator and the outer wall of the shaft support. Vibration-absorbing elements are preferably included in the system to maintain the gap and include, for example, O-rings. Also, the gap can be filled at least partially with a viscous medium. The coupling in the form preferably of O-rings, however, does not substantially transmit torque between the stator and the shaft support.

In the preferred embodiment of the invention as described in the specification, the torque transmission from the stator to the remaining housing takes place only via a supporting base plate. The base plate preferably includes a punched-out grid. The stator is mounted directly onto the supporting base plate. The base plate is in turn mounted to

the motor housing. The support shaft extends from the motor housing and rotatably supports the motor output shaft therein.

More specifically and with reference to the drawing figures of the application, in order to avoid noises which develop with prior art drives in use heretofore, the stator 7 is not joined directly to the shaft support 15. Rather, the shaft support 15 and the stator 7 are arranged such that a gap exists between an inner wall of the stator 7 and an outer wall of the shaft support 15. One or more O-rings 12 are disposed in grooves 12a on the outer wall of the shaft support 15. The O-rings 12 preferably have flexibility and produce a dampening effect, thus acting as vibration-dampening coupling elements between the stator and the shaft support 15. A viscous medium such as a grease or the like can be disposed in the gap between the stator and the shaft. It is to be appreciated that a substantially rigid coupling between the stator 7 and the shaft support 15 is avoided. Such a rigid coupling would support tangential power transmission or the transmission of torque from the stator 7 to the shaft support 15. This is undesirable and avoided in the present application.

In that regard, according to the preferred embodiment, the torque moment is not transmitted from the stator 7 through the shaft support 15. Rather, the torque moment is transmitted directly to the housing 3, and, more specifically, to the bottom of the housing 3. The shaft support 15, aside from providing a mounting for the rotor shaft 18, serves only to provide axial control or stabilization of the stator 7.

Since the base plate 19 is firmly mounted together with the attached stator 7 in the housing 3, the torque

moment transmission from the stator to the housing 3 takes place via the base plate 19. This arrangement produces an additional benefit in that the base plate 19, which typically has some flexibility, acts to dampen the high frequency variations of the transmitted torque. This additional benefit is obtained in particular when the base plate 19 is at least partially formed as an extrusion plastic-coated punched-out grid. The vibration dampening properties of the base plate 19 are particularly evident when the base plate 19 is not rigidly connected over its entire area with the housing 3 but rather is connected only in certain selected areas or spots such as, for example, is connected by means of screws or the like.

U.S. Patent No. 4,975,607 to Hara, et al.:

U.S. Patent No. 4,975,607 to Hara, et al. teaches a special, rather small sized motor type with an integrated frequency generator. The motor 1 includes a cup-shaped rotor yoke 2 which is fixed to a rotary shaft 5. The motor 1 includes a printed circuit board 14 disposed on the motor mounting portion 8 of a stationary drum 7. The printed circuit board 14 has a center hole engaging the holder length 9. A stator core 12 is mounted on the PCB 14 of the motor 1 which encircles the holder portion 9. The stator core 12 and the board 14 are fixed to the stationary drum 7 by fixing screws which pass through these members and engage the motor mounting portion 8.

As shown best in Figure 1 of the Hara, et al. '607 patent, the stator core 12 is connected directly to a motor mounting portion 8 which forms part of the shaft 5 support member. The PCB 14 is sandwiched between the stator core 12 and the motor mounting portion 8. Thus, the PCB can provide

no dampening effect between the stator core 12 and the motor mounting portion 8 forming a part of the shaft 5 support member. In effect, the stator core 12 and the motor mounting portion 8 together with the shaft support member overall produce a "tuning fork" effect because vibrations are undampened.

U.S. Patent No. 5,376,850 to Elsing, et al.:

U.S. Patent No. 5,376,850 to Elsing, et al. teaches a spindle motor for a disk drive data storage device in which the stator is isolated from the stationary portion of the motor used to attach the spindle motor to the disk drive housing by use of resilient members interposed between the stator and the stationary portion of the motor. As shown in Figure 4 of the Elsing, et al. '850 patent, metal-to-metal contact between the stator and the stationary portion of the motor in the axial direction is eliminated through the use of a non-metallic washer at one end of the stator and an axial O-ring at the other end of the stator. Circumferential movement of the stator relative to the stationary portion of the motor is prevented by use of a stator lock ring.

THE ART REJECTIONS

In the Office Action, claims 1, 11, 12, 15-18, 20-24, 26, 28, and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,975,607 to Hara, et al. and U.S. Patent No. 5,376,850 to Elsing, et al. Claims 13, 14, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hara, et al. and Elsing, et al. and further in view of foreign patent GB 2 293 695 to Norton, et al. Lastly, claim 19 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hara, et al. and Elsing, et al. and further in view of U.S. Patent No. 5,942,821 to Shin.

<u>All Pending Claims are Patentably Distinct And Unobvious Over the Art of Record</u>:

Independent claim 1 recites an electromotive drive comprising a housing, a stator, and a base plate. The housing has a shaft support in which a shaft of a rotor is rotationally mounted. The stator has drive windings and is traversed and retained by the shaft support. The stator is substantially retained in only transversal direction by the shaft support and is connected with the remaining housing for transmission of torque in a rotationally fixed manner. The base plate supports the stator relative to the housing. The base plate is fastened to the housing and formed as a punched-out grid whereby transmission of a torque moment from the stator to the motor housing occurs solely via the base plate fastened in the housing.

Applicants respectfully submit that none of the art cited by the Examiner teaches a stator mounted to a base plate which is in turn mounted to a housing in the manner

shown and described in the instant application. As noted above, the primary art reference cited by the Examiner in the Hara, et al. '607 patent teaches a stator 12 mounted directly to a shaft support member 8. In the present invention as cited in claim 1, the base plate mounting of the stator relative to the housing provides a dampening effect which is not and cannot be provided by the art cited by the Examiner.

With regard next to independent claim 11, an electromotive drive is recited comprising a housing, a base plate, a stator, a shaft, and a rotor attached to the shaft and surrounding the stator. The housing has an upwardly extending shaft support adapted to rotatably receive the shaft. The base plate is attached to the housing and the stator is attached to the base plate exclusively and without connection to the housing whereby torque transmission occurs from the stator to the housing through the base plate.

As pointed out above, the primary art reference of Hara, et al. '607 shows a stator 12 being coupled directly to a shaft support member 8 which is incapable of providing a dampening effect between the stator and the shaft support member. In the invention recited in independent claim 11, the stator is mounted to the base plate which is in turn mounted to the housing. Torque transmission occurs from the stator to the housing through the base plate. The intervening base plate provides substantial advantages and is not taught, suggested, or disclosed in the art references cited by the Examiner.

Independent claim 24 recites an electromotive drive comprising a housing, a shaft support extending from the housing, a base plate directly attached to the housing, a stator spaced apart from the shaft support and being

directly attached to the housing exclusively through the base plate, a shaft rotatably disposed within the shaft support, a rotor attached with the shaft, and a resilient member disposed between the stator and the shaft support.

Independent claim 24 is patentable over the art cited by the Examiner. The primary reference used by the Examiner of the Hara, et al. '607 patent shows a stator 12 mounted directly to a shaft support member 8. Independent claim 24 includes the limitation of the stator being directly attached to the housing exclusively through the base plate.

Independent claim 28 recites a pump motor operative in conjunction with a pump for a hydraulic system of a motor vehicle. The recited pump motor comprises a housing including an elongate shaft support, a stator surrounding the shaft support, a base plate providing a sole connection between the stator and the housing and providing dampening between the stator and the housing, a shaft rotatable within the shaft support, a rotor attached with the shaft, and a flexible coupling disposed between the stator and the shaft support.

None of the art cited by the Examiner teaches or suggests a base plate connecting a stator with a housing in the manner set forth in claim 28. At best, the Hara, et al. '607 patent relied upon by the Examiner teaches a stator 12 mounted directly to a shaft support member 8. This of course does not produce the advantageous results obtained by the present invention of a reduced vibration in the overall system.

For at least the above reasons, applicants respectfully submit that each of independent claims 1, 11, 24, and 28 are patentably distinct over the art of record.

Independent claims 1, 11, 24, and 28 and their respective dependent claims are therefore allowable over the art of record. Allowance of all pending claims and early notice to that effect is respectfully requested.

CONCLUSION

In view of the above amendments, comments, and arguments presented, applicants respectfully submit that all pending claims are patentably distinct and unobvious over the references of record.

Allowance of all claims and early notice to that effect is respectfully requested.

Respectfully submitted,

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